

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:	:	PATENT APPLICATION
Michael O. Okoroafor et al.	:	
Serial No. 09/695,332	:	Group Art Unit: 1711
Filed: October 25, 2000	:	Examiner: Rabon A. Sergent
For: METHOD OF PREPARING AN	:	Docket No.: 1555P1/RC
<u>OPTICAL POLYMERIZATE</u>	:	

BRIEF ON APPEAL

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

In response to the Office Action mailed May 3, 2005, this Appeal Brief is filed in compliance with 37 CFR 41.37©. Appellants file this Appeal Brief with the Board of Appeals and Interferences based on the rejections made in the Office Action mailed January 25, 2005. Please charge any additional fees or credit overpayment to Deposit Account No. 16-2025.

REAL PARTY IN INTEREST

The application has been assigned to PPG Industries Ohio, Inc., Cleveland, Ohio.

RELATED APPEALS AND INTERFERENCES

An appeal has been simultaneously filed in a Continuation-In-Part application relating to this patent case, having Serial Number 09/695,325 filed on October 25, 2000.

STATUS OF CLAIMS

Claims 1-119 are pending. Claims 1-119 are rejected and appealed.

STATUS OF AMENDMENTS

An Amendment After Final Rejection dated March 30, 2005, was filed by Appellants. An Advisory Action dated May 3, 2005 was received and the proposed amendments were entered.

SUMMARY OF CLAIMED SUBJECT MATTER

The present invention is directed to a method of preparing a non-elastomeric polymerizate comprising the step of polymerizing a two-component composition comprised of:

(a) a first component containing at least one reactant having at least two functional groups selected from isocyanate, isothiocyanate or combinations thereof, the reactant being the reaction product of,

(i) a polythiol monomer having at least two thiol groups; and

(ii) a monomer having at least two functional groups selected from isocyanate, isothiocyanate or combinations thereof; and

(b) a second component containing at least one polyamine reactant having at least two functional groups selected from primary amine, secondary amine or combinations thereof; wherein the molar equivalent ratio of (NCO + NCS) groups from said first component to (-NH₂ + -NH-) groups from said second component is from 0.5 to 100. In the specification see page 3, lines 11 through 23, which provides support for the claimed method of preparing a polymerizate that comprises the first and second components recited above. Further, in the specification, see page 22, line 31 and page 22, line 26 to page 3, line 6, which provide support for the non-elastomeric limitation in the claimed invention.

GROUNDINGS OF REJECTION TO BE REVIEWED ON APPEAL

1. Claims 1-119 stand rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement.
2. Claims 1-119 stand rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement.

ARGUMENT

Rejection of Claims 1-119 under 35 U.S.C. 112, First Paragraph, Written Description Requirement

Claims 1-119 were rejected under 35 U.S.C. 112, first paragraph as allegedly failing to comply with the written description requirement. The Examiner states that the claims allegedly contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors at the time the application was filed, had possession of the claimed invention.

The Examiner states that Appellants have allegedly failed to provide support for claiming that the polymerizate is non-elastomeric.

Appellants submit that several general rules have emerged from the Federal Circuit regarding the written description requirement. First, the subject matter of the claim need not be described literally or "in *ipsis verbis*" in order for the specification to satisfy the description requirement. *See, e.g., Cordis Corp. v. Medtronic Ave., Inc.*, 339 F.3d 1352 (Fed. Cir.), *reh'g denied*, 2003 U.S. App. LEXIS 22508 (2003); *In re Lukach*, 442 F.2d 967, 969, 169 U.S.P.Q. 795, 796 (C.C.P.A. 1971). Furthermore, it is sufficient that the specification "convey clearly to those skilled in the art the information that the appellant has invented the specific subject matter later claimed." *See, e.g., In re Wertheim*, 541 F.2d 257, 262, 191 U.S.P.Q. 90, 96 (C.C.P.A. 1976); *In re Ruschig*, 379 F.2d 990, 996, 154 U.S.P.Q. 118, 123 (C.C.P.A. 1967).

The Examiner states that Appellants have allegedly failed to adequately define what is meant by "non-elastomeric" and have failed to delineate how or what properties are governed by the language. Appellants submit that the term "non-elastomeric" has an ordinary meaning and thus, the term "non-elastomeric" would be clearly understood by one having ordinary skill in the art. The term "elastomer" has been defined as polymer(s) having "...the ability to be stretched to at least twice their original length and to retract very rapidly to approximately their original length when released. Among the better-known elastomers introduced since the 1930's are styrene-butadiene copolymer, polychloroprene (neoprene), nitrile rubber, butyl rubber, polysulfide rubber,..." (See *The Condensed Chemical Dictionary, Tenth Edition*). Thus, Appellants submit that the term

“non-elastomeric” would mean polymer(s) that do not have the ability to be stretched to at least twice their original length and are unable to retract very rapidly to approximately their original length when released.

The specification (see page 4, lines 19-24) discloses that the polymerizate of the invention has an initial Barcol hardness of at least 1. The term “hardness” has an ordinary meaning in the art. The term “hardness” has been defined as “The resistance of a material to deformation of an indenter of specific size and shape under a known load.” (See *The Condensed Chemical Dictionary, Tenth Edition*). In the specification, Examples 2 - 11 describe the preparation of plastic sheets. On page 30, lines 1- 2, it is disclosed that “The examples demonstrate the excellent high refractive index, high Abbe number and hardness (impact resistance) of the polymerizate of the present invention.”

Moreover, the specification (see page 22, line 31) discloses that the polymerizate of the invention has good impact resistance. The term “impact resistance/strength” has an ordinary meaning in the art. The term “impact strength” has been defined as “The ability of a material to accept a sudden blow or shock without fracture or other substantial damage, measured by standard impact-testing equipment.” (See *The Condensed Chemical Dictionary, Tenth Edition*).

Furthermore, the specification discloses that polymerizates prepared in accordance with the claimed invention will be solid and suitable for optical or ophthalmic applications, such as optical lenses, ophthalmic lenses, sun lenses, windows, automotive transparencies and aircraft transparencies (see the specification page 22, line 26 to page 23, line 6). Based on the disclosure in the specification of the above-mentioned characteristics of the claimed invention (e.g., hardness, impact strength, hardness, etc.) and the ordinary meaning of the term “non-elastomeric”, Appellants submit that adequate support and guidance is clearly provided in the specification for claiming a non-elastomeric polymerizate.

Rejection of Claims 1-119 under 35 U.S.C. 112,
First Paragraph, Enablement Requirement

The Examiner rejected claims 1-119 under 35 U.S.C. 112, first paragraph, as allegedly failing to comply with the enablement requirement. The Examiner states that the claims allegedly contain subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Appellants submit that the Federal Circuit has had an opportunity to decide a number of enablement issues. “The enablement requirement is satisfied when one skilled in the art, after reading the specification, could practice the claimed invention without undue experimentation.” *AK Steel Corp. v. Sollac*, 344 F.3d 1234, 1244 (Fed. Cir. 2003), citing *In re Wands*, 858 F.2d 731, 736-37 (Fed. Cir. 1988).

The Examiner has stated that all polythiourethanes have some degree of flexibility or elasticity; however, Appellants have failed to provide enablement for production of polythiourethanes lacking all elastomeric properties.

Appellants submit that adequate guidance which would enable one of ordinary skill in the art to make and use the claimed non-elastomeric polymerizate is clearly provided in the specification. The specification is directed to preparation of a polymerizate by polymerizing a two-component composition. The specification includes a detailed disclosure of the various materials used in preparing the two-component composition, the means of polymerizing the composition, and the characteristics of the resultant polymerizate (see page 4, lines 19-24, page 22, line 31, and page 22, line 26 to page 23, line 6). Appellants submit that in view of the specification, one of ordinary skill in the art could clearly practice the claimed invention without undue experimentation and therefore, the enablement requirement is clearly satisfied.

Moreover, the term “elastomer” and thus, “non-elastomeric”, has an ordinary meaning. The term “elastomer” has been defined as polymer(s) having “...the ability to be stretched to at least twice their original length and to retract very rapidly to approximately their original length when released. Among the better-known elastomers introduced since the 1930’s are styrene-butadiene copolymer, polychloroprene

(neoprene), nitrile rubber, butyl rubber, polysulfide rubber,...” (See *The Condensed Chemical Dictionary, Tenth Edition*). Thus, Appellants submit that the term “non-elastomeric” would be defined as polymer(s) that do not have the ability to be stretched to at least twice their original length and are unable to retract very rapidly to approximately their original length when released.

Furthermore, on page 22, line 13, it is disclosed that various conventional additives such as but not limited to flexibilizing additives can be added to the composition. Appellants submit that this disclosure provides support for the resultant polymerizate not being a flexible material. If a flexible material is desired, a flexibilizing additive can be added to produce such a polymerizate.

For all of the above reasons, it is respectfully requested that the case be remanded to the Examiner for issuance of a Notice of Allowance.

Respectfully submitted,



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October 7, 2005

CLAIMS APPENDIX

1. (previously presented): A method of preparing a non-elastomeric polymerizate comprising the step of polymerizing a two-component composition comprised of:

(a) a first component containing at least one reactant having at least two functional groups selected from isocyanate, isothiocyanate or combinations thereof, the reactant being the reaction product of,

(i) a polythiol monomer having at least two thiol groups; and

(ii) a monomer having at least two functional groups selected from isocyanate, isothiocyanate or combinations thereof; and

(b) a second component containing at least one polyamine reactant having at least two functional groups selected from primary amine, secondary amine or combinations thereof; wherein the molar equivalent ratio of (NCO + NCS) groups from said first component to (-NH₂ + -NH-) groups from said second component is from 0.5 to 100.

2. (original): The method of claim 1 wherein said first component further comprises (iii) a reactive hydrogen material having at least two reactive hydrogen groups, the reactive hydrogen material being selected from the group consisting of polyols and materials having both hydroxyl and thiol groups; and mixtures thereof.

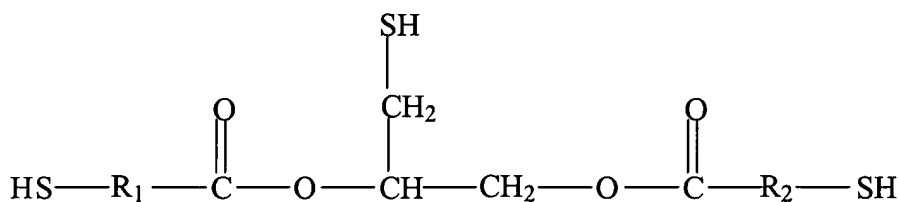
3. (original): The method of claim 1 wherein the relative amounts of (i) and (ii) in said first component are selected such that the molar equivalents ratio of (NCO + NCS)/(SH) is greater than 1.0.

4. (original): The method of claim 2 wherein the relative amounts of (i), (ii) and (iii) being in said first component are selected such that the molar equivalents ratio of (NCO + NCS)/(SH + OH) is greater than 1.0.

5. (original): The method of claim 1 wherein said first component and said second component are selected such that when they are polymerized, the resulting polymerizate has a refractive index of at least about 1.57, an Abbe number of at least about 30 and an initial Barcol hardness of at least 1.

6. (original): The method of claim 2 wherein the relative amounts of (i), (ii) and (iii) are selected such that the molar equivalents ratio of (NCO + NCS)/(SH + OH) is from 1.2:1.0 to 4.0:1.0.

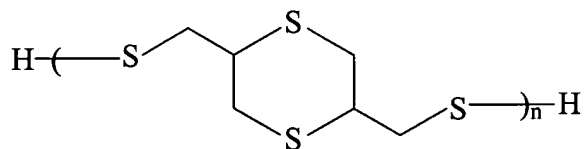
7. (original): The method of claim 1 wherein said polythiol monomer is selected from the group consisting of 2,5-dimercaptomethyl-1,4-dithiane, 2,2'-thiodiethanethiol, pentaerythritol tetrakis(3-mercaptopropionate), pentaerythritol tetrakis(2-mercaptopropionate), trimethylolpropane tris(3-mercaptopropionate), trimethylolpropane tris(2-mercaptopropionate), 4-mercaptopentyl-3,6-dithia-1,8-octanedithiol, 4-tert-butyl-1,2-benzenedithiol, 4,4'-thiodibenzenethiol, benzenedithiol, ethylene glycol di(2-mercaptopropionate), ethylene glycol di(3-mercaptopropionate), poly(ethylene glycol) di(2-mercaptopropionate) and poly(ethylene glycol) di(3-mercaptopropionate), a polythiol represented by the general formula:



wherein R₁ and R₂ are each independently selected from straight or branched chain alkylene, cyclic alkylene, phenylene and C₁-C₉ alkyl substituted phenylene, and oligomers of said polythiols; and mixtures of said polythiol monomers.

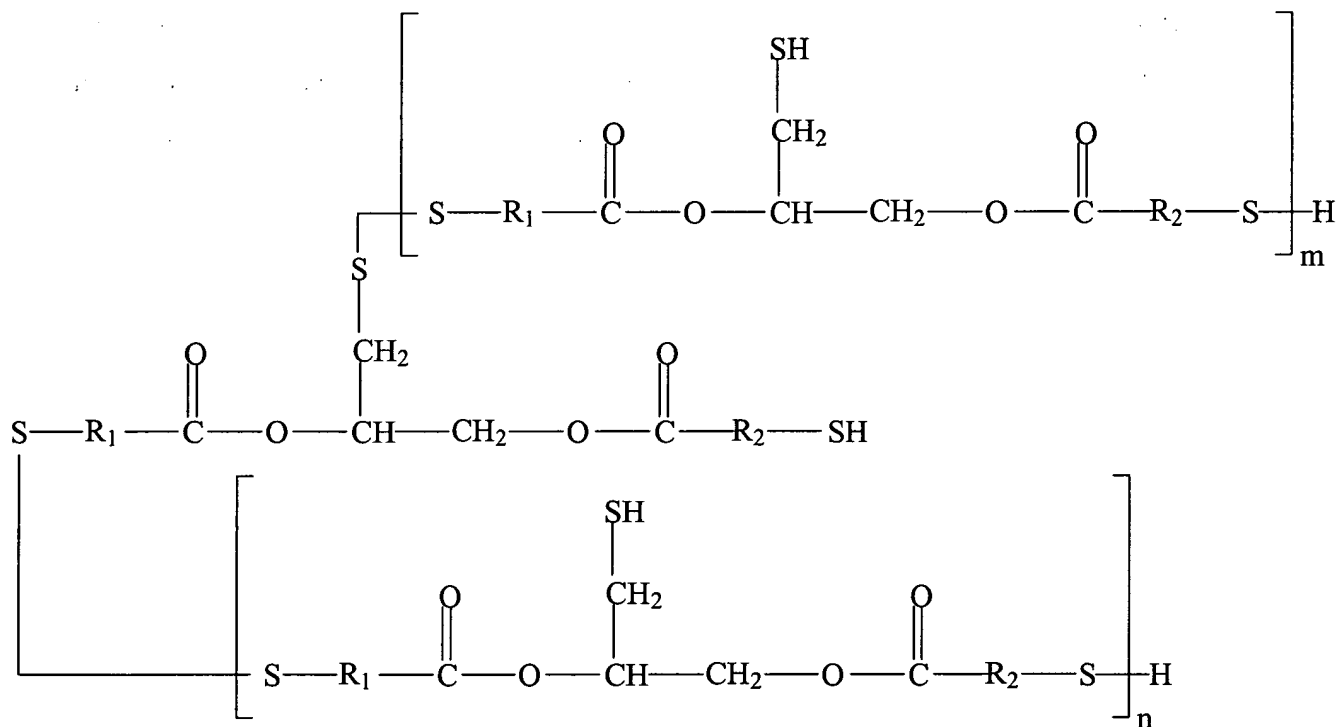
8. (original): The method of claim 7, wherein said polythiol oligomer has disulfide linkages and is prepared by reacting a polythiol monomer, with sulfur, in the presence of a basic catalyst.

9. (original): The method of claim 7 wherein said polythiol oligomer is represented by the general formula:



wherein n is an integer from 1 to 21.

10. (. (original): The method of claim 7 wherein said polythiol oligomer is represented by the general formula:

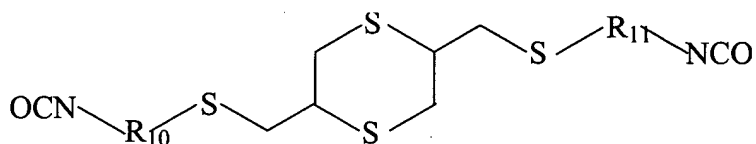


wherein R₁ and R₂ are each independently selected from straight or branched chain alkylene, cyclic alkylene, phenylene and C₁-C₉ alkyl substituted phenylene and n and m are independently integers from 0 to 21 such that n + m is at least 1.

11. (previously presented): The method of claim 1 wherein said monomer is a material having at least two isocyanate groups.

12. (previously presented): The method of claim 1 wherein said monomer is a material having one or more sulfur atoms in its backbone.

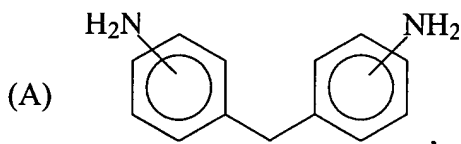
13 (previously presented): (previously presented): The method of claim 12 wherein the monomer having one or more sulfur atoms in its backbone is one having the general structure:

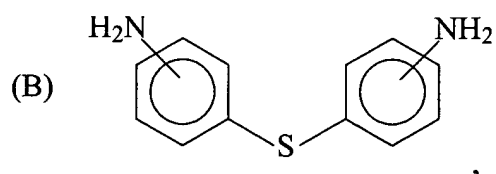


wherein R₁₀ and R₁₁ are each independently C₁ to C₃ alkyl.

14. (previously presented): The method of claim 11 wherein said monomer is selected from the group consisting of α,α' -xylene diisocyanate, $\alpha,\alpha,\alpha',\alpha'$ -tetramethylxylene diisocyanate, isophorone diisocyanate, bis(isocyanatocyclohexyl)methane, ortho-toluidine diisocyanate, ortho-tolylidene diisocyanate, ortho-tolylene diisocyanate and 4,4'-diphenylmethane diisocyanate, and mixtures of said monomers.

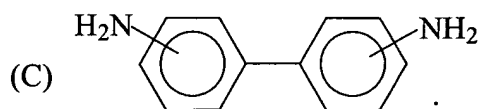
15. (original): The method of claim 1 wherein said polyamine reactant of said second component is selected from the group consisting of ethyleneamines, C₁-C₃ dialkyl toluenediamine, methylene dianiline, trimethyleneglycol di(para-aminobenzoate), a diamine represented by the general formula (A):



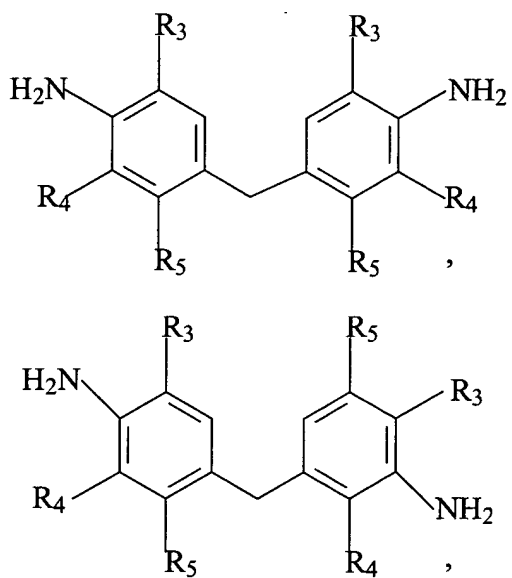


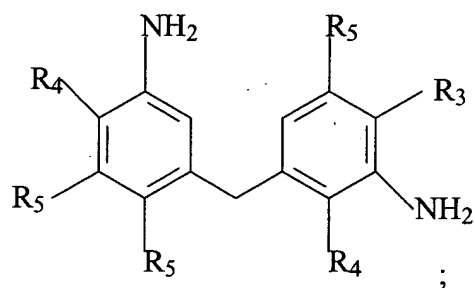
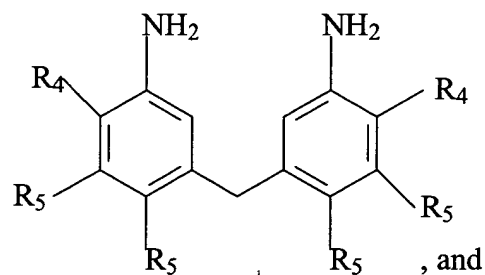
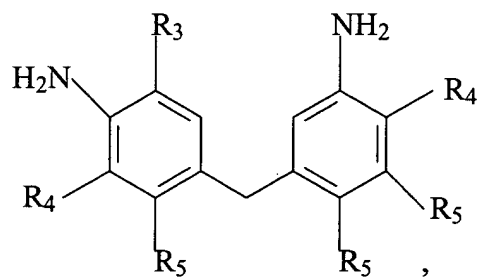
a diamine represented by the general formula (B):

and a diamine represented by the general formula (C):



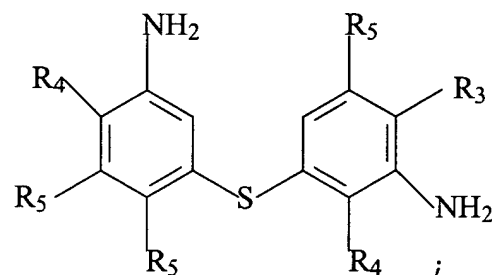
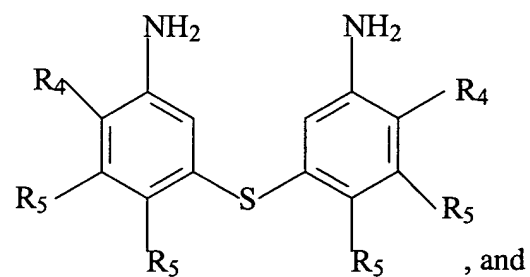
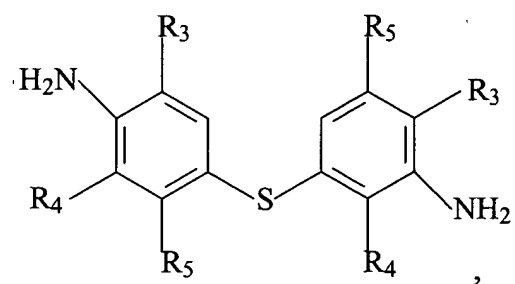
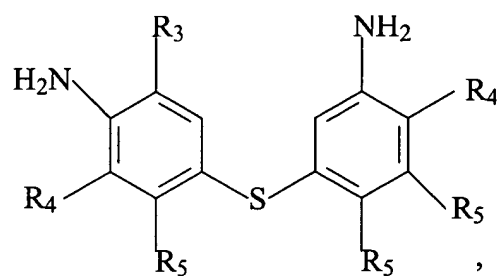
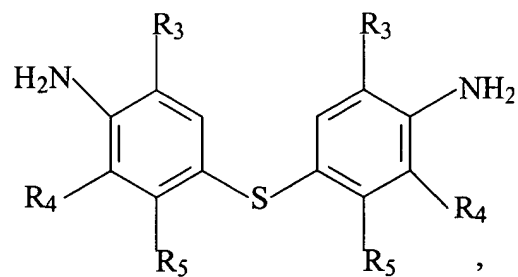
16 (previously presented): (original): The method of claim 15 wherein the diamine of general formula (A) is selected from one or more of the group consisting of:





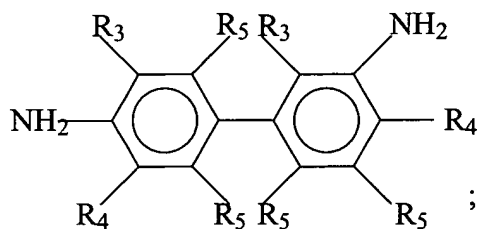
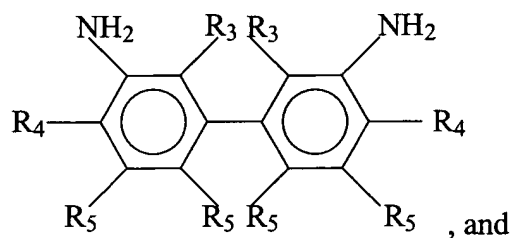
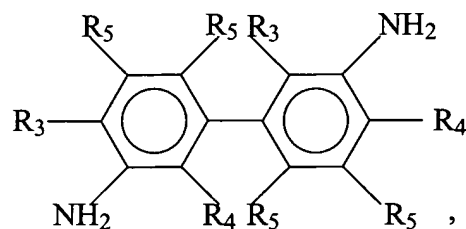
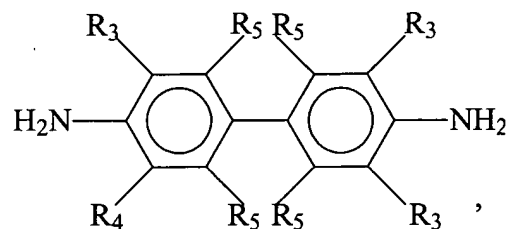
wherein R_3 and R_4 are each independently C_1 - C_3 alkyl, and R_5 is selected from hydrogen and halogen, and mixtures of said diamines.

17. (original): The method of claim 15 wherein the diamine of general formula (B) is selected from one or more of the group consisting of:



wherein R_3 and R_4 are each independently C_1 - C_3 alkyl, and R_5 is selected from hydrogen and halogen, and mixtures of said diamines.

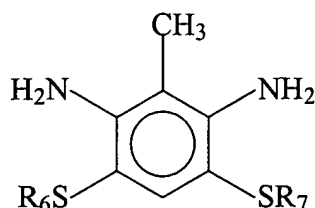
18. (original): The method of claim 15 wherein the diamine of general formula (C) is selected from one or more of the group consisting of:



wherein R₃ and R₄ are each independently C₁-C₃ alkyl, and R₅ is selected from hydrogen and halogen, and mixtures of said diamines.

19. (original): The method of claim 1 wherein said polyamine reactant of said second component is a diamino toluene dialkyl sulfide.

20. (original): The method of claim 19 wherein said diamino toluene dialkyl sulfide is a 2,6 diaminotoluene-3,5-dialkyl sulfide of the general formula:



wherein R_6 and R_7 are linear, branched or cyclic C_1 to C_{20} alkyl.

21. (original): The method of claim 1 further comprising the step of adding a catalyst to said two-component composition.

22. (original): The method of claim 21 wherein said catalyst is selected from the group consisting of tertiary amines and organometallic compounds.

23. (original): The method of claim 1 further comprising the step of :
mixing said first component and said second component.

24. (original): The method of claim 1 further comprising the step of :
degassing said first component.

25. (original): The method of claim 1 further comprising the step of :
degassing said second component.

26. (original): The method of claim 23 further comprising the step of
adding the mixture to a mold.

27. (original): The method of claim 26 further comprising the step of :
heating the mold and the mixture of said first component and said second component
within it.

28. (original): The method of claim 27 wherein said heating step further includes heating the mold and said mixture to a temperature of from 100°C to 140°C over a period of from 0.5 to 16 hours.

29. (original): The method of claim 1 wherein said first component and said second component are polymerized together in amounts sufficient to provide a molar equivalent ratio of (NCO + NCS) groups to (-NH₂ + -NH-) groups of from 0.5 to 10.

30. (original): The method of claim 1 wherein said first component and said second component are polymerized together in amounts sufficient to provide a molar equivalent ratio of (NCO + NCS) groups to (-NH₂ + -NH-) groups of from 0.5 to 5.

31. (original): The method of claim 1 further comprising the step of adding additives selected from the group consisting of light stabilizers, heat stabilizers, antioxidants, ultraviolet light absorbers, mold release agents, static (non-photochromic) dyes, pigments and flexibilizing additives and anti-yellowing additives; and mixtures of said additives.

32. (original): The method of claim 31 wherein the additives are present in said two component composition, in an amount up to 10% by weight of said two component composition.

33. (original): The method of claim 31 wherein the mold release agent is a C₈ to C₁₆ alkyl phosphate ester.

34. (original): The method of claim 1 wherein said polymerizate further comprises a photochromic substance.

35. (previously presented): A non-elastomeric polymerizate prepared by polymerizing a two-component composition comprised of:

(a) a first component containing at least one reactant having at least two functional groups selected from isocyanate, isothiocyanate or combinations thereof, the reactant being the reaction product of,

(i) a polythiol monomer having at least two thiol groups; and

(ii) a monomer having at least two functional groups selected from isocyanate, isothiocyanate or combinations thereof; and

(b) a second component containing at least one polyamine reactant having at least two functional groups selected from primary amine, secondary amine or combinations thereof; wherein the molar equivalent ratio of (NCO + NCS) groups from said first component to (-NH₂ + -NH-) groups from said second component is from 0.5 to 100.

36. (original): The polymerizate of claim 35 wherein said first component further comprises (iii) a reactive hydrogen material having at least two reactive hydrogen groups, the reactive hydrogen material being selected from the group consisting of polyols and materials having both hydroxyl and thiol groups, and mixtures thereof.

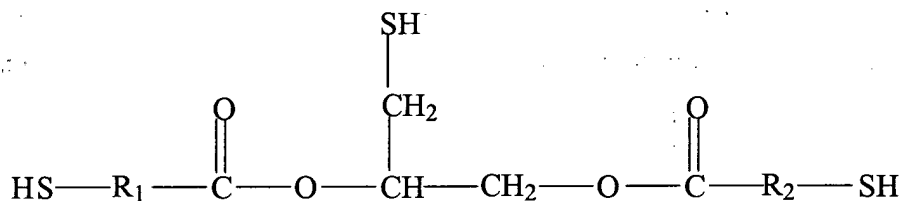
37. (original): The polymerizate of claim 35 wherein the relative amounts of (i) and (ii) in said first component are selected such that the molar equivalents ratio of (NCO + NCS)/(SH) is greater than 1.0.

38. (original): The polymerizate of claim 36 wherein the relative amounts of (i), (ii) and (iii) being in said first component are selected such that the molar equivalents ratio of (NCO + NCS)/(SH + OH) is greater than 1.0.

39. (original): The polymerizate of claim 35 wherein said first component and said second component are selected such that when they are polymerized, the resulting polymerizate has a refractive index of at least about 1.57, an Abbe number of at least about 30 and an initial Barcol hardness of at least 1.

40. (original): The polymerizate of claim 38 wherein the relative amounts of (i), (ii) and (iii) are selected such that the molar equivalents ratio of (NCO + NCS)/(SH + OH) is from 1.2:1.0 to 4.0:1.0.

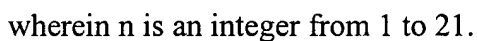
41. (original): The polymerizate of claim 35 wherein said polythiol monomer is selected from the group consisting of 2,5-dimercaptomethyl-1,4-dithiane, 2,2'-thiodiethanethiol, pentaerythritol tetrakis(3-mercaptopropionate), pentaerythritol tetrakis(2-mercaptoacetate), trimethylolpropane tris(3-mercaptopropionate), trimethylolpropane tris(2-mercaptoacetate), 4-mercaptomethyl-3,6-dithia-1,8-octanedithiol, 4-tert-butyl-1,2-benzenedithiol, 4,4'-thiodibenzenethiol, benzenedithiol, ethylene glycol di(2-mercaptoacetate), ethylene glycol di(3-mercaptopropionate), poly(ethylene glycol) di(2-mercaptoacetate) and poly(ethylene glycol) di(3-mercaptopropionate) and a polythiol represented by the general formula:



wherein R₁ and R₂ are each independently selected from straight or branched chain alkylene, cyclic alkylene, phenylene and C₁-C₉ alkyl substituted phenylene, and oligomers of said polythiols, and mixtures of said polythiol monomers.

42. (original): The polymerizate of claim 41 wherein said polythiol oligomer has disulfide linkages and is prepared by reacting a polythiol monomer with sulfur in the presence of a basic catalyst.

43. (original): The polymerizate of claim 41 wherein said polythiol oligomer is represented by the general formula:

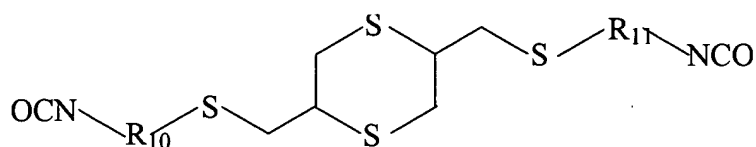

$$\begin{array}{c}
 \left[\text{S}-\text{R}_1-\text{C}(=\text{O})-\text{O}-\underset{\text{CH}_2}{\underset{\text{SH}}{\text{CH}}}-\text{CH}_2-\text{O}-\text{C}(=\text{O})-\text{R}_2-\text{S} \right]_m \text{H} \\
 | \\
 \text{S}-\text{R}_1-\text{C}(=\text{O})-\text{O}-\underset{\text{CH}_2}{\text{CH}}-\text{CH}_2-\text{O}-\text{C}(=\text{O})-\text{R}_2-\text{SH} \\
 | \\
 \left[\text{S}-\text{R}_1-\text{C}(=\text{O})-\text{O}-\underset{\text{CH}_2}{\underset{\text{SH}}{\text{CH}}}-\text{CH}_2-\text{O}-\text{C}(=\text{O})-\text{R}_2-\text{S} \right]_n \text{H}
 \end{array}$$

45. (previously presented): The polymerizate of claim 35 wherein said monomer is a material having at least two isocyanate groups.

46. (previously presented): The polymerizate of claim 45 wherein said monomer is selected from the group consisting of α,α' -xylene diisocyanate, $\alpha,\alpha,\alpha',\alpha'$ -tetramethylxylene diisocyanate, isophorone diisocyanate, bis(isocyanatocyclohexyl)methane, ortho-toluidine diisocyanate, ortho-tolyldine diisocyanate, ortho-tolylene diisocyanate and 4,4'-diphenylmethane diisocyanate, and mixtures of said monomers.

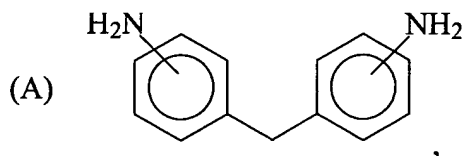
47. (previously presented): The polymerizate of claim 45 wherein said monomer contains one or more sulfur atoms in its backbone.

48. (previously presented): The photochromic article of claim 47 wherein the monomer containing one or more sulfur atoms in its backbone has the general structure:

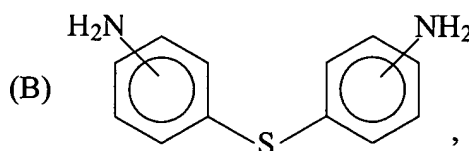


wherein R_{10} and R_{11} are each independently C_1 to C_3 alkyl.

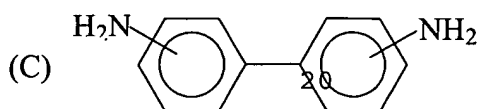
49. (original): The polymerizate of claim 35 wherein said polyamine reactant of said second component is selected from the group consisting of ethyleneamines, C_1 - C_3 dialkyl toluenediamine, methylene dianiline, trimethyleneglycol di(para-aminobenzoate), a diamine represented by the general formula (A):



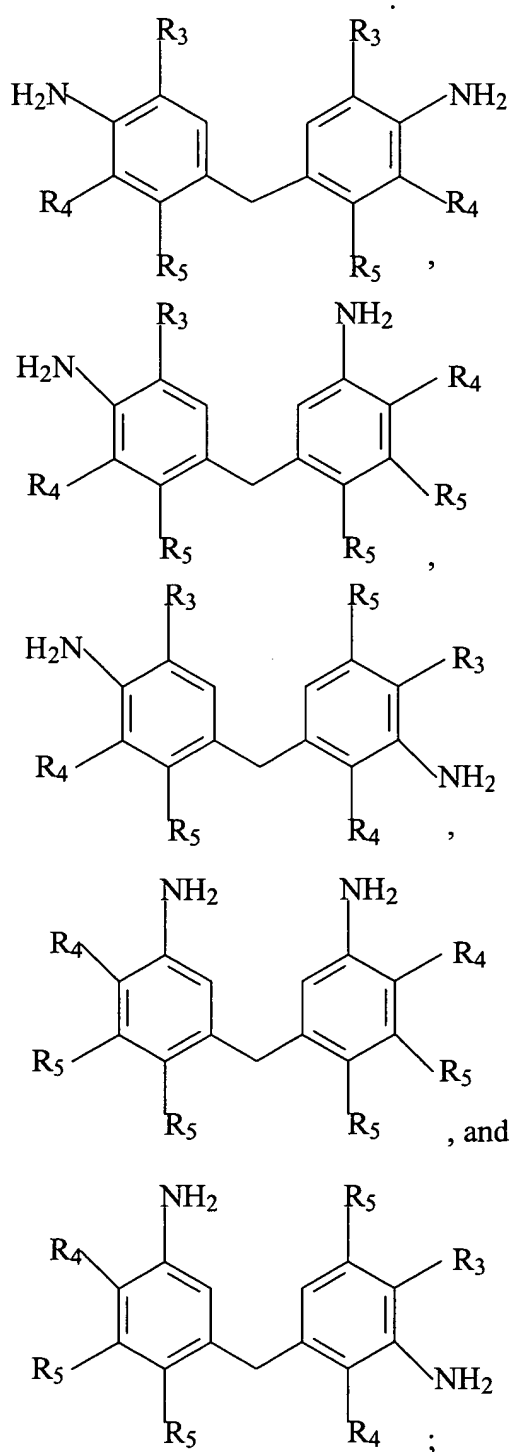
a diamine represented by the general formula (B):



and a diamine represented by the general formula (C):

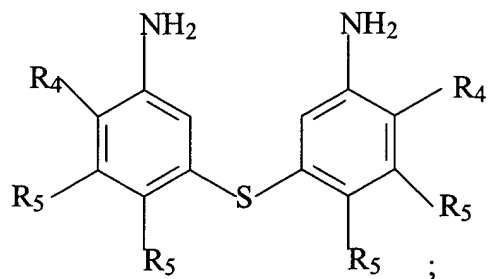
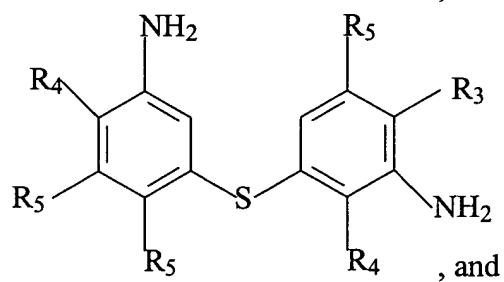
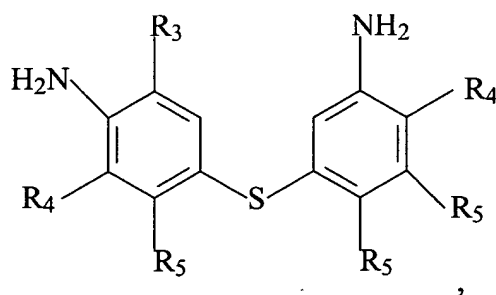
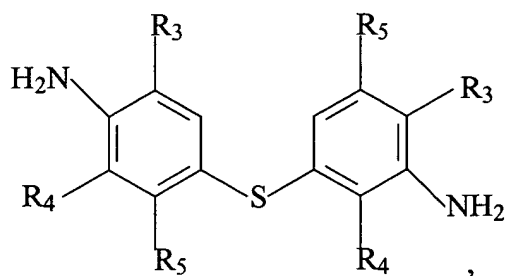
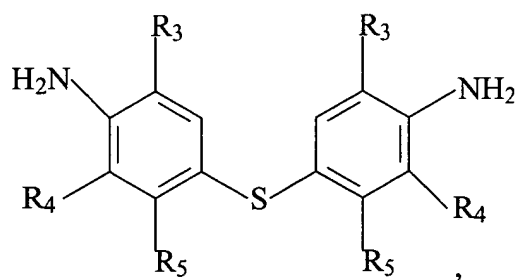


50. (currently amended): The polymerizate of claim 49 wherein the diamine of general formula (A) is selected from one or more of the group consisting of:



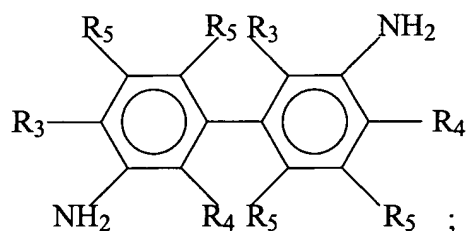
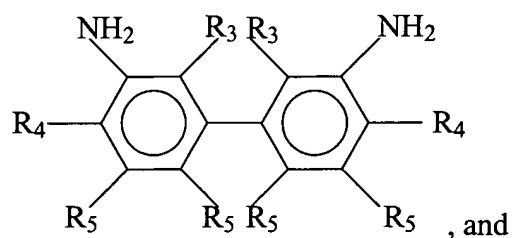
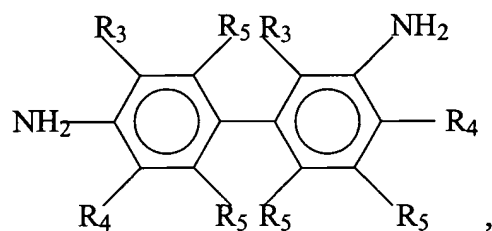
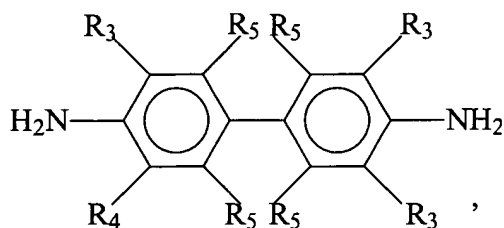
wherein R₃ and R₄ are each independently C₁-C₃ alkyl, and R₅ is selected from hydrogen and halogen, and mixtures of said diamines.

51. (original): The polymerizate of claim 49 wherein the diamine of general formula (B) is selected from one or more of the group consisting of:



wherein R_3 and R_4 are each independently C_1 - C_3 alkyl, and R_5 is selected from hydrogen and halogen, and mixtures of said diamines.

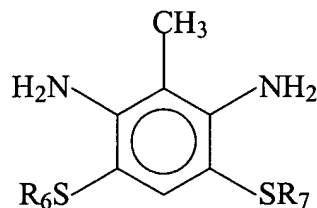
52. (original): The polymerizate of claim 49 wherein the diamine of general formula (C) is selected from one or more of the group consisting of:



wherein R_3 and R_4 are each independently C_1 - C_3 alkyl, and R_5 is selected from hydrogen and halogen, and mixtures of said diamines.

53. (original): The polymerizate of claim 35 wherein said polyamine reactant of said second component is a diamino toluene dialkyl sulfide.

54. (original): The polymerizate of claim 53 wherein said diamino toluene dialkyl sulfide is a 2,6 diaminotoluene-3,5-dialkyl sulfide of the general formula:



wherein R_6 and R_7 are linear, branched or cyclic C_1 to C_{20} alkyl

55. (original): The polymerizate of claim 35 wherein a catalyst is added to said two-component composition to promote the polymerization.

56. (original): The polymerizate of claim 55 wherein said catalyst is selected from the group consisting of tertiary amines and organometallic compounds.

57. (original): The polymerizate of claim 35 wherein the polymerization process further comprises the step of :mixing said first component and said second component.

58. (original): The polymerizate of claim 35 wherein the polymerization further comprises the step of :degassing said first component.

59. (original): The polymerizate of claim 35 wherein the polymerization further comprises the step of : degassing said second component.

60. (original): The polymerizate of claim 57 wherein the polymerization further comprising the step of:adding the mixture to a mold.

61. (original): The polymerizate of claim 60 wherein the polymerization further comprising the step of: heating the mold and the mixture of said first component and said second component within it.

62. (original): The polymerizate of claim 61 wherein said heating step further includes heating the mold and said mixture to a temperature of from 100°C to 140° over a period of from 0.5 to 16 hours.

63. (original): The polymerizate of claim 35 wherein said first component and said second component are polymerized together in amounts sufficient to provide a molar equivalent ratio of (NCO + NCS) groups to (-NH₂ + -NH-) groups of from 0.5 to 10.

64. (original): The polymerizate method of claim 35 wherein said first component and said second component are polymerized together in amounts sufficient to provide a molar equivalent ratio of (NCO + NCS) groups to (-NH₂ + -NH-) groups of from 0.5 to 5.

65. (original): The polymerizate of claim 35 further comprising additives selected from the group consisting of light stabilizers, heat stabilizers, antioxidants, ultraviolet light absorbers, mold release agents, static (non-photochromic) dyes, pigments and flexibilizing additives and anti-yellowing additives; and mixtures of said additives.

66. (original): The polymerizate of claim 65 wherein the mold release agent is a C₈ to C₁₆ alkyl phosphate ester.

67. (original): The polymerizate of claim 65 wherein the additives are present in said polymerizate in an amount up to 10% by weight of said polymerizate.

68. (original): The polymerizate of claim 35 further comprising a photochromic substance.

69. (previously presented): A photochromic article derived from a non-elastomeric polymerizate prepared by polymerizing a two-component composition comprised of:

(a) a first component containing at least one reactant having at least two functional groups selected from isocyanate, isothiocyanate or combinations thereof, the reactant being the reaction product of,

(i) a polythiol monomer having at least two thiol groups; and

(ii) a monomer having at least two functional groups selected from isocyanate, isothiocyanate or combinations thereof; and

(b) a second component containing at least one polyamine reactant having at least two functional groups selected from primary amine, secondary amine or combinations thereof; wherein the molar equivalent ratio of (NCO + NCS) groups from said first component to (-NH₂ + -NH-) groups from said second component is from 0.5 to 100.

70. (original): The photochromic article of claim 69 wherein said first component further comprises (iii) a reactive hydrogen material having at least two reactive hydrogen groups, the reactive hydrogen material being selected from the group consisting of polyols and materials having both hydroxyl and thiol groups, and mixtures thereof.

71. (original): The photochromic article of claim 69 wherein the relative amounts of (i) and (ii) in said first component are selected such that the molar equivalents ratio of (NCO + NCS)/(SH) is greater than 1.0.

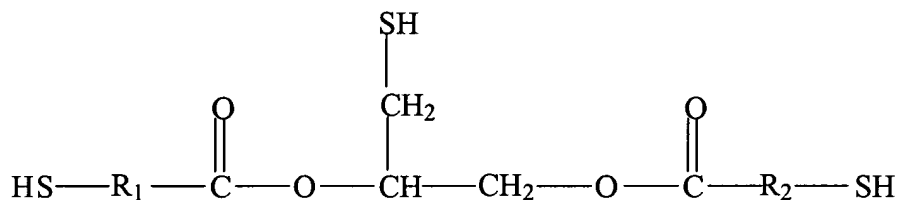
72. (original): The photochromic article of claim 70 wherein the relative amounts of (i), (ii) and (iii) being in said first component are selected such that the molar equivalents ratio of (NCO + NCS)/(SH + OH) is greater than 1.0.

73. (original): The photochromic article of claim 69 wherein said first component and said second component are selected such that when they are polymerized,

the resulting polymerizate has a refractive index of at least about 1.57, an Abbe number of at least about 30 and an initial Barcol hardness of at least 1.

74. (original): The photochromic article of claim 70 wherein the relative amounts of (i), (ii) and (iii) are selected such that the molar equivalents ratio of (NCO + NCS)/(SH + OH) is from 1.2:1.0 to 4.0:1.0.

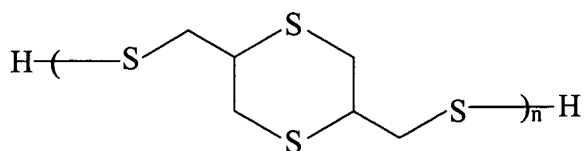
75. (original): The photochromic article of claim 69 wherein said polythiol monomer is selected from the group consisting of 2,5-dimercaptomethyl-1,4-dithiane, 2,2'-thiodiethanethiol, pentaerythritol tetrakis(3-mercaptopropionate), pentaerythritol tetrakis(2-mercaptoacetate), trimethylolpropane tris(3-mercaptopropionate), trimethylolpropane tris(2-mercaptoacetate), 4-mercaptomethyl-3,6-dithia-1,8-octanedithiol, 4-tert-butyl-1,2-benzenedithiol, 4,4'-thiodibenzenethiol, benzenedithiol, ethylene glycol di(2-mercaptoacetate), ethylene glycol di(3-mercaptopropionate), poly(ethylene glycol) di(2-mercaptoacetate) and poly(ethylene glycol) di(3-mercaptopropionate), a polythiol represented by the general formula:



wherein R₁ and R₂ are each independently selected from straight or branched chain alkylene, cyclic alkylene, phenylene and C₁-C₉ alkyl substituted phenylene, and oligomers of said polythiols; and mixtures of said polythiol monomers.

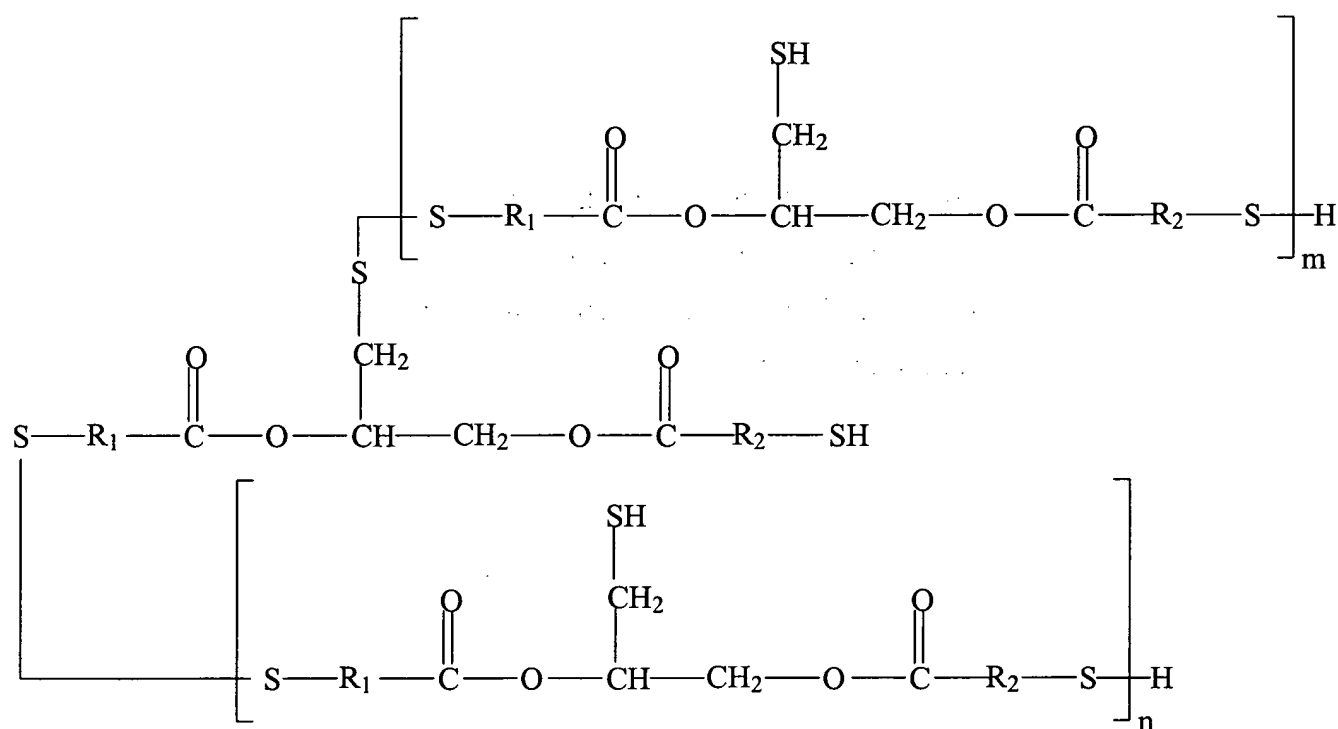
76. (original): The photochromic article of claim 75 wherein said polythiol oligomer has disulfide linkages and is prepared by reacting a polythiol monomer with sulfur in the presence of a basic catalyst.

77. (original): The photochromic article of claim 75 wherein said polythiol oligomer is represented by the general formula:



wherein n is an integer from 1 to 21.

78. (original): The photochromic article of claim 75 wherein said polythiol oligomer is represented by the general formula:



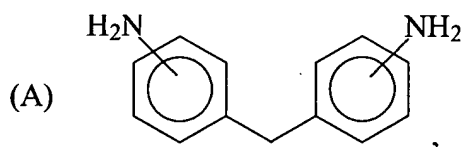
wherein R₁ and R₂ are each independently selected from straight or branched chain alkylene, cyclic alkylene, phenylene and C₁-C₉ alkyl substituted phenylene and n and m are independently integers from 0 to 21 such that n + m is at least 1.

79. (previously presented): The photochromic article of claim 69 wherein said monomer is a material having at least two isocyanate groups.

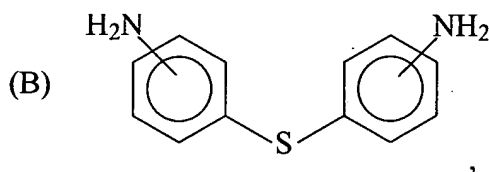
80. (previously presented): The photochromic article of claim 79 wherein said monomer is selected from the group consisting of α,α'-xylene diisocyanate, α,α',α',α'-

tetramethylxylene diisocyanate, isophorone diisocyanate, bis(isocyanatocyclohexyl)methane, ortho-toluidine diisocyanate, ortho-tolylidene diisocyanate, ortho-tolylene diisocyanate and 4,4'-diphenylmethane diisocyanate, ; and mixtures of said monomers.

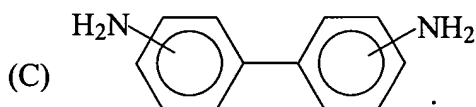
81. (original): The photochromic article of claim 69 wherein said polyamine reactant of said second component is selected from the group consisting of ethyleneamines, C₁-C₃ dialkyl toluenediamine, methylene dianiline, trimethyleneglycol di(para-aminobenzoate), a diamine represented by the general formula (A):



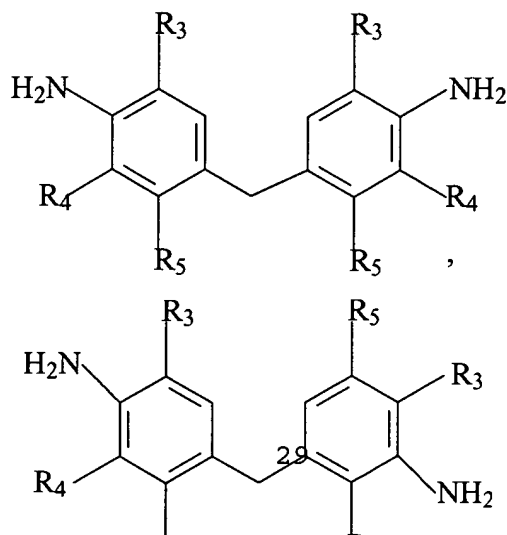
a diamine represented by the general formula (B):

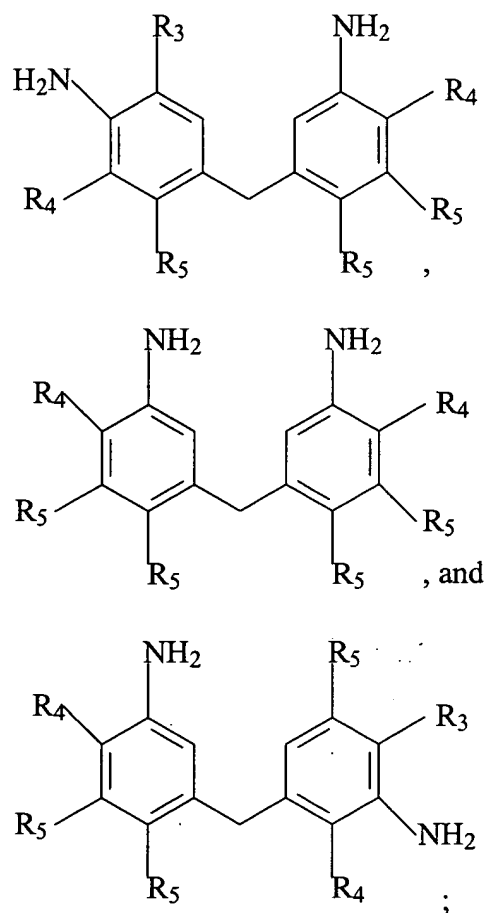


and a diamine represented by the general formula (C):



82. (previously presented): The photochromic article of claim 81 wherein the

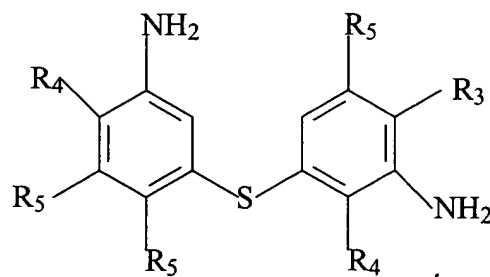


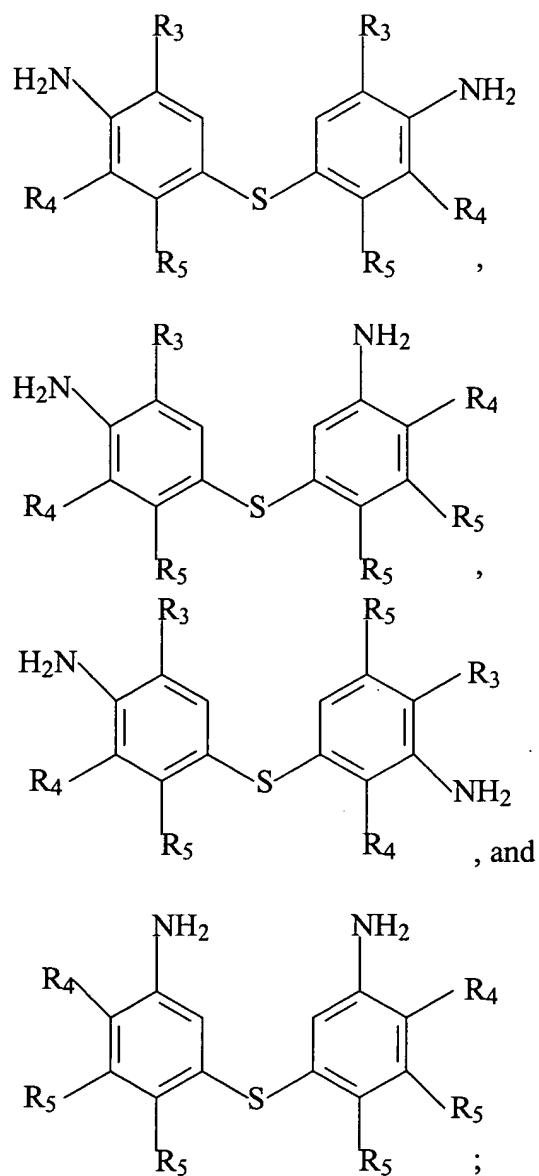


diamine of general formula (A) is selected from one or more of the group consisting of:

wherein R_3 and R_4 are each independently C_1 - C_3 alkyl, and R_5 is selected from hydrogen and halogen, and mixtures of said diamines.

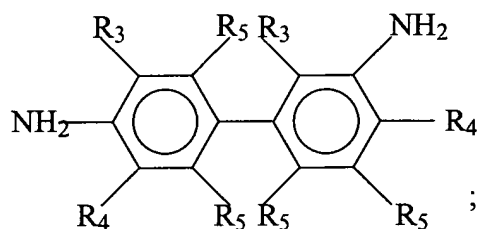
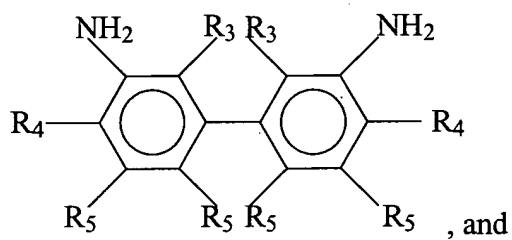
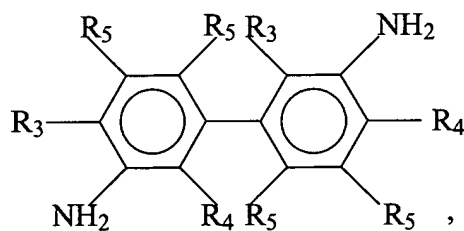
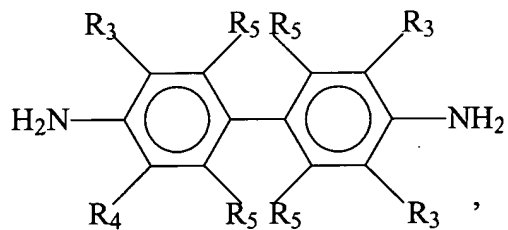
83. (previously presented): The photochromic article of claim 81 wherein the diamine of general formula (B) is selected from one or more of the group consisting of:





wherein R₃ and R₄ are each independently C₁-C₃ alkyl, and R₅ is selected from hydrogen and halogen, and mixtures of said diamines.

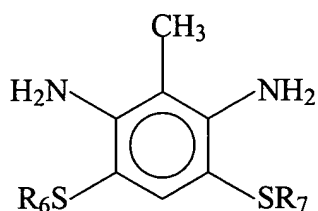
84. (previously presented): The photochromic article of claim 81 wherein the diamine of general formula (C) is selected from one or more of the group consisting of:



wherein R_3 and R_4 are each independently C_1 - C_3 alkyl, and R_5 is selected from hydrogen and halogen, and mixtures of said diamines.

85. (previously presented): The photochromic article of claim 69 wherein said polyamine reactant of said second component is a diamino toluene dialkyl sulfide.

86. (previously presented): The photochromic article of claim 85 wherein said diamino toluene dialkyl sulfide is a 2,6 diaminotoluene-3,5-dialkyl sulfide of the general



formula:

wherein R_6 and R_7 are linear, branched or cyclic C_1 to C_{20} alkyl

87. (original): The photochromic article of claim 69 wherein a catalyst is added to said two-component composition to promote the polymerization.

88. (original): The photochromic article of claim 87 wherein said catalyst is selected from the group consisting of tertiary amines and organometallic compounds.

89. (original): The photochromic article of claim 69 wherein the polymerization process further comprises the step of :

mixing said first component and said second component.

90. (original): The photochromic article of claim 69 wherein the polymerization process further comprises the step of :

degassing the said first component.

91. (original): The photochromic article of claim 69 wherein the polymerization process further comprises the step of :

degassing the said second component.

92. (original): The photochromic article of claim 69 wherein the polymerization process further comprises the step of :

adding a mixture of said first component and said second component to a mold.

93. (original): The photochromic article of claim 92 wherein the polymerization process further comprises the step of:

heating the mold and said mixture within it.

94. (original): The photochromic article of claim 93 wherein said heating step further includes heating the mold and said mixture to a temperature of from 100°C to 140°C over a period of from 0.5 to 16 hours.

95. (original): The photochromic article of claim 69 wherein said first component and said second component are polymerized together in amounts sufficient to provide a molar equivalent ratio of (NCO + NCS) groups to (-NH₂ + -NH-) groups of from 0.5 to 10.

96. (original): The photochromic article of claim 69 wherein said first component and said second component are polymerized together in amounts sufficient to provide a molar equivalent ratio of (NCO + NCS) groups to (-NH₂ + -NH-) groups of from 0.5 to 5.

97. (original): The photochromic article of claim 69 further comprising additives selected from the group consisting of light stabilizers, heat stabilizers, antioxidants, ultraviolet light absorbers, mold release agents, static (non-photochromic) dyes, pigments and flexibilizing additives and anti-yellowing additives; and mixtures of said additives.

98. (original): The photochromic article of claim 97 wherein the additives are present in said polymerizate in an amount up to 10% by weight of said polymerizate.

99. (original): The photochromic substance of claim 97 wherein the mold release agent is a C₈ to C₁₆ alkyl phosphate ester.

100. (original): The photochromic article of claim 69 further comprising a photochromic substance.

101. (original): The photochromic article of claim 100 wherein the photochromic substance is mixed with said first component.

102. (original): The photochromic article of claim 100 wherein the photochromic substance is mixed with said second component.

103. (original): The photochromic article of claim 100 wherein the photochromic substance is applied to said photochromic article at from 0.15 to 0.35 milligrams per square centimeter of surface area of said photochromic article.

104. (original): The photochromic article of claim 100 wherein said photochromic substance is selected from the group consisting of spiro(indoline)naphthoxazines, spiro(indoline)benzoxazines, chromenes, benzopyrans, naphthopyrans, organo-metal dithizonates, (aryloxy)-thioformic arylhydrazidates, mercury dithizonates, fulgides, fulgimides, 3-furyl fulgides, 3-thienyl fulgides, 3-furyl fulgimides and 3-thienyl fulgimide; and mixtures of said photochromic substances.

105. (original): The photochromic article of claim 100 wherein the photochromic substance has an activated absorption maximum within the visible range of from 590 to 700 nanometers.

106. (original): The photochromic article of claim 100 wherein the photochromic substance has an activated absorption maximum within the visible range of from 400 to 500 nanometers.

107. (original): The photochromic article of claim 100 wherein the photochromic substance has an activated absorption maximum within the visible range of from 500 to 700 nanometers.

108. (original): The photochromic article of claim 100 wherein the photochromic substance is applied or incorporated into said photochromic article using a method selected from the list consisting of cast curing, encapsulating within a matrix of an organic polymerizate and incorporating into the two-component composition prior to curing.

109. (original): The photochromic article of claim 100 wherein the photochromic substance is applied by imbibing the photochromic article such that permeation of the photochromic substance into the polymerizate is achieved.

110. (original): The photochromic article of claim 109 wherein the imbibing process includes solvent assisted transfer absorption.

111. (original): The photochromic article of claim 109 wherein the imbibing process includes vapor phase transfer.

112. (original): The photochromic article of claim 100 wherein the photochromic substance is applied as a coating to the surface of the photochromic article.

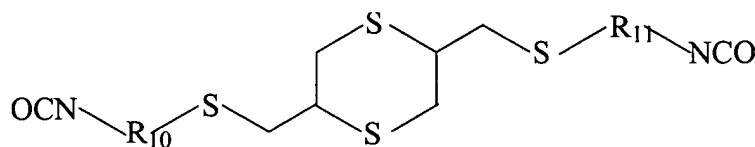
113. (original): The photochromic article of claim 109 wherein the imbibing process includes the steps of:

- coating the photochromic article with the photochromic substance;
- heating the surface of the photochromic article; and
- removing the residual coating from the surface of the photochromic article.

114. (original): The photochromic article of claim 100 wherein the photochromic article is an optical lens for correcting a visual defect.

115. (previously presented): The photochromic article of claim 69 wherein said monomer contains one or more sulfur atoms in its backbone.

116. (previously presented): The photochromic article of claim 115 wherein the monomer containing one or more sulfur atoms in its backbone has the general structure:



wherein R₁₀ and R₁₁ are each independently C₁ to C₃ alkyl.

117. (original): The method of claim 1 wherein the polymerization is carried out by reaction injection molding, wherein said first component and said second component are each metered from a cylinder through a mixing head and injected into a molding machine.

118. (original): The polymerizate of claim 35 prepared by polymerizing said first component and said second component by reaction injection molding, wherein said first component and said second component are each metered from a cylinder through a mixing head and injected into a molding machine.

119. (original): The photochromic article of claim 69 prepared by polymerizing said first component and said second component by reaction injection molding, wherein said first component and said second component are each metered from a cylinder through a mixing head and injected into a molding machine.

EVIDENCE APPENDIX

None

RELATED PROCEEDINGS APPENDIX

None